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LITERAL ENGLISH TRANSLATION OF
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Device for inserting a cord into a cable conduit for the purpose of subsequently drawing in an electrical cable

[0001] This invention refers to a device for inserting a cord into a cable conduit, so that subsequently and with the aid of this cord, an electrical cable can be drawn into the empty cable conduit laid.

[0002] Almost everywhere that electric cabling is to be laid in buildings, empty plastic cable conduits are first laid and these are then embedded in concrete or otherwise covered over. It is only at a later phase in the construction work, namely once the building has been erected, that electric wiring or cables are drawn into these empty cable conduits. The pre-installed plastic conduits have an inner diameter of a few millimetres and are smooth on the inside, however some have a grooved surface and these are known as flexible conduits. The grooves run around the circumference of the conduit's section, making it easier for them to be laid around tight curves without running the risk of creating a hollow where the conduit is depressed, which will make the subsequent pulling through of a cable more difficult or even impossible.

[0002] Subsequent insertion of an electric cable generally presents no problems for short runs of conduit and where they run more or less in a straight line. However, where the empty conduit is particularly long, say 10 or 20 metres and more, and above all if it is laid along a lot of tight curves, insertion of an electric cable is often problematical. The procedure is that first an insertion strip in the form of a flexible nylon rod with a thickness of 2-3 mm and a length of up to 20 metres is fed into the empty conduit and pushed right through until its tip comes out at the other end. At the lower end, an electric cable can be attached and then drawn through the conduit by pulling on the tip of the nylon rod. If an empty conduit should be particularly long or pass through many curves, or both, then the insertion of the rod by pushing it from one end will no longer be possible. Its tip will either be blocked by too tight a curve or the friction will simply become so great that the rod cannot be pushed through until its tip emerges at the other end. In this event, assistance can be provided by a vacuum cleaner: This is attached and sealed to the far end of the conduit and suction applied to the air inside. At the lower end a cord is inserted and this is then taken up and carried along by the airflow and in this way it can easily be pulled through over big distances and around many curves, until its tip emerges into the vacuum cleaner's bag. If suction continues to be applied and more cord is fed in, then the further end of the cord will simply collect in the vacuum cleaner bag. The nozzle of the vacuum cleaner can be removed from the conduit and the surplus cord can then be withdrawn from the vacuum cleaner's bag. With the aid of this cord, the electric cable can either be pulled directly into the conduit, or used first to pull through a nylon rod, the so-called insertion strip. Once the insertion strip has been pulled into the conduit, the insertion of an electric cable presents no further problems: It is simply attached to the end of the rod and pulled with this through to the end of the conduit. However, the employment of a vacuum cleaner is not particularly practical for various reasons.

[0003] The first consideration is that the vacuum cleaner applies suction. This means that it must have an airtight connection to one end of the conduit and the cord then has to be inserted at the conduit's other end, so that suction can be applied to the cord from one end of the conduit, by means of the vacuum cleaner.

If the conduit in a given building runs around many corners and/or through several storeys, then the usage of a vacuum cleaner is particularly laborious if a single electrician is carrying out the installation work. In this case, he has to first connect the vacuum cleaner then go to the other end of the conduit to feed in the cord. After this, he has to go back to the vacuum cleaner and connect it to the conduit next in line and so on. If many conduits are involved that each require a cord to be inserted, then many actions are involved: The fitter will need to keep going back and forth between the two ends of the conduits. For this reason, it is preferable for the electric cables to be installed by two fitters. By employing a vacuum cleaner then, the insertion of a cord must basically be worked on from both ends at the same time. If conduits should emerge at points where access is poor or perhaps in a ceiling, then the connection of a vacuum cleaner nozzle often presents problems. In addition, a vacuum cleaner is a heavy and bulky piece of equipment for carrying out this work. After all, it was not actually designed and intended for inserting cords into conduits. In the state of the art a blower pistol is disclosed in EP 0 277 029 A (COMMW IND GASES) of 3th August 1988. This pistol comprises a manual valve for controling the gas flow from a pressure air source. The gas is supplied by a pressure source, namely from a gas cylinder, e.g. from a cylinder which is filled with carbiondioxid. DE 12 26 673 B (ROLAND SCHEUCHZER DR) of 13th October 1966 discloses a device that works with a pressure source whereby the pressure air is lead by a pressure line to the device and which does push a cork through the conduit pipe which cork does then pull the cord into the conduit pipe. US 6 264 170 B1 (CASELLA DAVID WAYNE) of 24th July 2001 discloses a pneumatic pistol which also works with pressure aire of a pressure source. All these devices require the supply of pressure air.

[0004] For this and other reasons, the inventive task has been to create a device, by means of which the insertion of cables into conduits can be made easier without the need of a pressure air source which does facilitate the pulling in of cables on site substantially. This device is intended to enable a more practical way of working than was hitherto employed for the insertion of cables. The insertion of a cord is to be able to be carried out just from one end of the conduit. In addition,

the device is to be light and handy, so that it can be connected to less accessible conduit openings. By using this device, a cord is to be particularly easily and quickly inserted into a conduit, so that it can then drag a cable or a rod in directly, by means of which an electrical cable can finally be pulled into the conduit.

[0005] This task will be solved by a device for inserting a cord into a cable conduit for the purpose of subsequently pulling through an electrical cable, comprising a hollow cylindrical holding container for taking a cord reel to be unwinded, an outlet nozzle for the outlet of the cord an the front side of this holding container and a housing at the backside of the holding container, the housing being equipped with a handle in the form of a pistol-like grip, and a push, toggle or rocker switch, characterized in that a blower pipe or a rod extends axially through the complete hollow and cylindrical holding container and projects into the outlet nozzle, whereby a cylindrical cord reel with cylindrical outer side and for unwinding from inside fits with its outer diameter into the holding container and with its central free space over this pipe or this rod, such that the pipe or rod does cross the inserted cord reel completely and remains spaced from the cord reel around itself, further that the housing behind the holding container contains an electrical fan, the air current produced by this fan being able to pass from the backside of the holding container through the pipe or on its outer side along the pipe or rod and henceforth through the outlet nozzle on the front side of the holding container to the outside, so that this current of air continually unwinds cord from the inner side of the reel and takes it out through the nozzle.

[0006] The illustrations show such a device in a sample design, followed by a description where its function is explained with reference to these illustrations.

They show:

Fig. 1: A three dimensional drawing of the device

Fig. 2: The device in longitudinal section

Fig. 3: A side view of the device

[0007] Fig. 1 shows a three dimensional view of the device at an angle to the front right hand side. The device's design is very simple and essentially consists of a fan 1 with a blower piper 2 and a holding container 3 placed around the blower pipe 2 for a hollow cylindrical cord reel 4. This cord reel 4 can be seen here because the holding container 3 is made from a transparent polycarbonate or Plexiglas piece of tubing, thus providing a view of the interior. The cord reel 4 inserted in the holding container 3 has the shape of a hollow cylinder, so that it therefore exhibits a free space 5 along the axis of the cylinder, from which the cord 6 is gradually (i.e. layer by layer) spooled radially to the outside. This cord reel 4 contains a cable insertion cord. The reel's dimensions are about 110 mm in diameter and 100 mm in length, with a free space having a diameter of some 30 mm. At the front end, the tubular holding container 3 is bonded to a flange 7, which in relation to the outer surface of the holding container 3 forms a radial projection. A further flange 8 is mounted on this projection and screwed to the holding container 3, along with the first flange 7. This outer flange 8 has a hole at its centre that is bigger than the diameter of the blower pipe 2. A socket 9 is fitted to this flange's hole and in this a nozzle 10 is inserted. The blower pipe 2 stretches from the fan 1 right through the whole holding container 3 and extends about half way into the socket 9. At the rear of the fitted flange 8, not visible here, there is a retaining ring 11 separated from it by means of supports 12, which keeps the cord reel 4 back, so that it is always situated next to the fan 1. The unreeled cord 6 then runs inside the cord reel 4 along the outside of the blower pipe 2 and is then carried in the front part of the device, between the outside of the blower pipe and the inside of the socket 8 into the inside of the nozzle 10 and finally exits to the outside at the front end of the nozzle 10. An electrical power cord 13 leads to the fan to power the fan's motor and on the outside of the fan 1, i.e. mounted on its housing, is a handle 14, which here forms two opposing grips. Fitted to the housing 1 above the handle 14 is a push, toggle or rocker switch 20. The handle 14 can be held in a pistol-like grip as indicated on the drawing and leaving the forefinger able to operate the switch 20. Because the handle is shaped like a letter W, it can be grasped like a pistol grip both from the front and from behind. In

addition, the shape it forms protects the switch 20 from damage.

[0008] Fig. 2 shows a longitudinal section of this device, though contrary to Fig. 1, the view is from the other side. On the basis of this sectional drawing, the device's design can be understood in detail: On the right of the image, the fan 1 is to be seen, which is contained in a hollow cylindrical casing 15. This casing 15 is closed front and rear by an annular bezel cap 16 & 17. The bezel 16 at the back of the device carries a socket-shaped air intake socket 18, in which a mesh grid 19 is employed, say of a 1 mm gauge, so that no larger objects can be sucked into the fan during use. On the other side of the fan there is a central hole in the annular bezel 17, into which the blower pipe 2 is inserted and sealed or screwed in. On the other side of this annular bezel 17 and thus inside the housing, the actual fan is mounted. This is just a commercially-available vacuum cleaner fan with a power rating of say 840W. Obviously, other types of fan can be used with a higher or lower power output. However, in practice it has been revealed that a vacuum cleaner fan of about the rating mentioned is completely sufficient.

[0009] A handle 14 is fitted to the bottom of the casing 14, which with its two loops projecting downwards form a grip, enabling each loop to be grasped and held by one hand like a pistol grip. On the fan's housing, above the handle 14 and at its centre, a switch 20 is fitted, which can be conveniently operated by the index finger of the hand holding the device. The switch 20 has the advantage of being a rocker switch that is sprung loaded and can be rotated around from its vertical position in two directions and which then closes the circuit, thus powering the fan and setting the fan's motor in motion. However, a toggle switch is also suitable for use as the switch 20 and this will retain its on position when operated, having to be actively moved back to its neutral position. A push-button switch is also conceivable and this only closes the power circuit when it is pressed.

[0010] In the picture, the hollow cylindrical cord reel 4 has been placed over the blower pipe 2 from the left, so that it then encloses the blower pipe 2 with its inner space, but leaving a small gap between its inside and the blower pipe of some 1 to 2 mm. The cord reel 4 is enclosed by a holding container 3 that is preferably to be

made from a piece of Plexiglas or polycarbonate tubing, because Plexiglas will provide a view of the interior of the holding container 3, making it possible to check at any time whether the cord reel 4 still has sufficient cord for further use. At the front end of the holding container 3 sits the flange 7, which forms a radial projection from the Plexiglas tube. A further flange 8 with a central hole is screwed on to this projection, above which a socket 9 is placed at the front. On the rear side of the flange 8 a number of supports 12 extend into the holding container 3 and carry a retaining ring on their ends. This retaining ring 11 ensures that the cord reel 4 is always pushed against the cover 17 on the fan housing. At the same time, the blower pipe 2 extends a little into this socket 9. At the front, a circular groove 25 has been cut out of the inside of the socket to accommodate an O-ring. A nozzle 10 is inserted into this socket 9 and this is sealed in the socket 9 by the O-ring, forming a funnel-shaped extension 21 inside in the area of the blower pipe's opening. At the leading edge, the nozzle 10 has been given a straight bore 22 that at its outer end has a wider bore 23 with an annular groove 24 for accepting, securing and sealing a socket. A helical groove 26 has been machined out of the outer side of the nozzle. The socket 9 is interspersed by a radially-drilled bore 27, through which a bolt (not shown here) is passed and which projects into the groove 26 on the nozzle 10. By rotating the nozzle 10 it is wound more or less in or out of the socket. When wound in, the funnel-shaped inner wall clamps the cord to such an extent that it cannot be carried through any more by the air current.

[0011] If the electric fan's motor is now switched on, then an air current will be generated through the device. At the back, where the air intake socket 19 is, air will be sucked in and pass along the blower pipe 2, then to be expelled at its front opening through the nozzle 10. The cord 6 from the reel 4 runs as shown on the drawing from the inside of the cord reel 4, along the outside of the blower tube 2 to its opening and from there through the nozzle 10 to the outside. It is carried on by the prevailing air current and thus continually unreeled from the cord reel 4 and conveyed to the outside. However, if the nozzle 10 is rotated clockwise as viewed from the front of the device, then it will be screwed into the socket 9 and its funnel-shaped interior will clamp the cord between it and the outside of the blower pipe's

opening, so that the cord can no longer continue to be transported. This clamping action is so strong then that the prevailing air current is no longer capable of unwinding the cord from its reel 4 and conveying it to the outside. This function is required occasionally, should the device be used merely for blowing through an empty conduit for the purpose of identifying its other end: Air is blown through, and if at the other end, which may be in another room or on another level of the building, air is expelled then this will permit the relevant conduit to be identified, in the event that several conduits have been run in parallel through the brickwork.

[0012] In Fig. 3, the device is to be seen in side view. At the front on the nozzle 10, a flexible tube 28 has made from plastic has been attached as an adaptor. This flexible tube 28 has the advantage of being made from commercially-available coolant hose, as is used on machine tools for conveying coolant. With its pointed opening, this flexible tube 28 can also form a sealed connection on less accessible conduits. In one variant, even a closed pipe or a rod can replace the blower pipe 2 that runs through the holding container 3 and over which the cord reel 4 is placed with its free space. Air will not then be blown through the pipe itself, but will flow outside and along it or the rod in an axial direction through the cord reel. In the version shown in Fig. 2, the air from the fan could then even enter through holes or bores in the bezel 17 into the holding container 3 and flow around this in an axial direction along the pipe 2, whilst the interior of the pipe 2 would be closed off. Additionally, the air does not have to be blown, but merely conveyed. Therefore an arrangement would be conceivable, in which the fan, in relation to Fig. 2, would not be behind the holding container but in front of it, so that the air would be sucked along a central pipe or rod, or through a central pipe, which would lead through the fan, after which the air would then pass through a nozzle at the end of the fan.

[0013] In order to insert a cord into a conduit, the end of the cord emerging from the flexible tube 28 is eased into it then the device applied to the conduit by means of the flexible tube 28, forming a seal against it. Then the switch 20 is operated and straight away the cord will be blown into the conduit. It will be carried along by the air current generated through the whole length of the conduit, no matter how

long it may be and how many curves it negotiates or how tight they are. Tests have shown that it can even be inserted through a whole roll of conduit, i.e. in the lengths that conduit is stored and sold. However the device can also be used in the identification of conduits that have been laid. To achieve this, the nozzle is rotated so as to form a brake for the cord. Now the device can be used just for blowing nothing but air. Therefore it is a simple matter to apply blown air quickly to several conduit openings of a whole bundle of conduits, one after another. To achieve this, it is best that the conduits are numbered, and each conduit is blown in ascending numerical order. An assistant at the opposite end of the bundle will then number the openings, one after the other and in the order in which the air flows out. This way it is possible to identify which openings are connected with one another. The device can also be used for applying suction. To achieve this, a cord is inserted from the opening at the opposite end and the device is connected to the opening at this end, using a suction coupling. In this case, the cord is pulled along by the current of air formed by the suction. When it emerges on this side, i.e. at the opening where the device is located, it will collect at the mesh grid in the air intake. By this means, the latter will become almost completely blocked after a short time, which will become noticeable by a change in the sound of the fan or the motor. This way, it will be immediately known that the cord has arrived at the device and that it has passed through the whole of the conduit.

[0014] This device enables work to be undertaken in a very practical manner. In particular, the insertion of a cord from one end only can be carried out by a single operative. In addition, the device is light and handy and can therefore be connected to less accessible conduit openings and in particular to those with their openings in a ceiling. By means of this device, a cord can be inserted into a conduit particularly easily and quickly, so that it can then pull through an electric cable directly, or a rod first, which in turn will be used to pull an electric cable through the conduit.